

In the Office Action, claims 1-21 were rejected under 35 U.S.C. § 103 based on the cited art. Claims 1-21 were rejected as being unpatentable over Street in view of Watanabe. Regarding claims 1, 8, 11, 15 and 20, the Examiner stated that it would have been obvious for a person of ordinary skill in the relevant art employing a stereoscopic device as taught by Street to incorporate Watanabe's controllable multi-wavelength illuminating unit in place of Street's illuminating unit being controlled by Street's control circuit so as to produce at least two alternating beams of light (R, G, B) having a different range of wavelengths for generating a more accurate color video signal, thus improving image quality.

Claim 1 of the application is directed at producing a stereoscopic color image from a black and white image and not at improving such an image.

Moreover, Street discloses a system that provides a stereoscopic image using a single charge coupled device (CCD) and provides a controller that sequences between the two apertures and the CCD. This controller is not adapted for timing sequenced light, nor is it adapted to control the CCD according to lighting sequences.

Watanabe discloses a system that provides improved color monocular images, using sequenced lighting and provides a controller, which sequences between the alternating light beams and the CCD. This controller is not adapted for timing sequenced apertures, nor is it adapted to control the CCD according to aperture sequences.

The controllers operate differently and are compatible, teaching away from combining with the other. Although neither Street nor Watanabe suggest combining with the other, even if the references are combined, the combination does not arrive at the present invention. Neither Street nor Watanabe, teach or suggest synchronizing a CCD, multiple apertures and multiple light beams. Combining the systems of Street and Watanabe would only provide one of the following combinations:

- (a) A system that includes the controller of Street and does not include the controller of Watanabe. Such a system would have alternating apertures but not alternating light beams.
- (b) A system that includes the controller of Watanabe and does not include the controller of Street. Such a system shall have alternating light beams but not alternating apertures.

- (c) A system that includes the controller of Street and the controller of Watanabe, each operating as single controllers, but not coupled or synchronized there between. Such a system shall have alternating apertures and alternating light beams. However, the aperture sequences and the light beam sequences are controlled by different controllers, and the CCD is controlled by two controllers that are not inter-coordinated. Therefore, such a system may, at best, produce non-stable stereoscopic images of random color.

For example, the CCD controller requires exposure for a minimal time period, before downloading the captured image. Each of the two controllers is programmed to enable the CCD that minimal time period, but since they are not synchronized there between, one may provide an exposure initiation instruction to the CCD after the other has done the same, thereby shortening the exposure time period beneath the minimal exposure time period. Similarly, one of the controllers may provide an image download instruction right after the second controller has provided an exposure initiation instruction, thereby shortening again the exposure time period, beneath the minimal exposure time period.

Hence, the system of Street and Watanabe cannot guarantee that at the moment the image is downloaded, the CCD is fully exposed by an appropriate aperture. Furthermore, the system cannot guarantee that the appropriate light beam is illuminating the object.

The technique disclosed in the present application provides a non-obvious configuration that employs a CCD, alternating apertures and alternating light beams, as well as a plurality of timing sequences (see Figures 21A, 21B) that are directed at synchronizing between the aperture mechanism and the lighting mechanisms so that only **one** light valve is open and only **one** alternating beam of light illuminates the detected scene. Neither Street nor Watanabe teach such mechanisms, nor do they disclose controlling such timing schemes for improved image quality. Accordingly Applicants assert that claim 1 is not anticipated by Street in view of Watanabe.

Regarding claims 4-5 and 7, the Examiner stated that it is considered a simple design of choice for Watanabe's illuminating unit to surround Street's aperture or to direct light aside from the aperture in order to efficiently illuminate different ranges of wavelengths to a maximum level. Claim 5 is cancelled. Claim 4 is directed at the illuminating unit to surround the apertures. Claim 7 is directed at the light dispersing unit surrounding the apertures.

Applicants assert that the Examiner's argument is not supported by the cited references. The illuminating unit according to Watanabe includes a rotary filter placed in front of a single light source lamp. It would not be considered obvious for this illuminating unit to surround Street's aperture. Furthermore, Watanabe does not teach nor does the reference suggest modifying the light source so that the light source can surround an aperture. The structures recited in claims 4 and 7 are specific modifications of the invention that provide advantages and are not a matter of design choice. Accordingly, Applicants assert that claims 4 and 7 are not anticipated by Street in view of Watanabe.

Regarding claim 6, the Examiner stated that a light dispersing unit is inherently shown in Figure 1 of Watanabe, but not indicated as an element, and that a light guiding means is connected between the light source and the light dispersing unit for guiding light. However, none of the disclosed references includes a light dispersing unit. The shape to which the Examiner is referring, appearing in Figure 1 between the light guide and the object, consists of two lines, one slanted upwards and one slanted downwards. A similar shape appears in the same drawing next to the light source lamp, strongly suggesting that this shape merely indicates only light beams and it would not be understood by one of ordinary skill in the art to be a light dispersing unit. Accordingly, Applicants assert that claim 6 is not anticipated by Street in view of Watanabe.

Regarding claim 9, the Examiner stated that Street discloses a controller connected to the light valves and the light sensor array, and it would have been obvious in view of Watanabe's illumination unit for timing the operation of the light valves and the sensor array. However, the same argument applies to claim 9 as the argument given with respect to claim 1. Moreover, claim 9 controls the timing of the light valves, the multi wavelength sensor array *and* the multi wavelength illumination unit. Such control of all three variables is neither shown nor suggested by the cited art or any combination thereof. By timing all of these components in a synchronized manner, at the moment the image is downloaded, there is full exposure by an appropriate aperture with the appropriate light beam illuminating the object. This cannot be accomplished with any combination of the cited prior art. Accordingly, Applicants contend that claim 9 is not anticipated by Street in view of Watanabe.

Regarding claim 10, it appears that the Examiner mistakenly addressed claim 10 instead of claim 11. Claim 10 does not indicate a storage unit.

Applicants assert that claims 12-14 and 16-17 are also allowable as they depend from claim 1, which is allowable as stated above. Moreover, claims 12-14 and 16-17 recite additional structure that provide advantages over the prior art.

Moreover, the method of claim 20 recites a method that is neither shown nor suggested by the prior art or any combination thereof. As stated above with regard to claim 1, the prior art does not teach or suggest multiple apertures and/or multiple light beams or controlling in the claimed method so that only one of the apertures is open and only one of the light beams illuminates the scene. The recited method provides advantages in detecting stereoscopic images that is not possible with a method under Street, Watannabe, or any combination thereof. Moreover, claim 21 provides for clarification of the present method over the prior art.

Claims 18 and 19 were rejected as being unpatentable over Street and Watannabe in view of Yamashita et al. Claims 18 and 19 have now been canceled.


In view of the foregoing, entry and approval of these amendments and a speedy and favorable action are respectfully solicited. If the Examiner feels that a telephone interview may be helpful in this matter, please contact Applicant's representative at 612.336.4728.

Respectfully submitted,

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Marked Up Version Showing Changes Made

In the Specification

Please amend the paragraph beginning on page 29, line 24 as follows:

Reference is now made to Figure 15, which is an illustration in perspective of a color illumination unit, generally referenced 670, constructed and operative in accordance with a further preferred embodiment of the present invention. Unit 670 includes a [light-guiding element] light dispersing unit 671, which is generally shaped as an open-cut hollow cone, having a narrow section 674 and a wide section 672. A detection head according to the invention, such as described in Figure 2 (referenced 202), can be placed within the hollow space of the light-guiding element 671. A multi-color light source 680 can be connected to the narrow section 674. Light, such as light ray 678, which is emitted from the light source 680, is directed via the light guiding element 671, and is projected through the wide section 672.

Please amend the paragraph beginning on page 33, line 13 as follows:

System 800 includes a multiple aperture 804, a controller 834, an image detector 812, a storage unit 836, an image processor 838, a movement detector 814 and an illumination unit 830. The controller 834 is connected to the multiple aperture 804, the image detector 812, the storage unit 836, movement detector 814 and to the illumination unit 830. The storage unit 836 is further connected to the image processor 838. The multiple aperture 804 includes a plurality of apertures, generally referenced 802, where each aperture can be activated to be open or closed. It is noted that when an aperture is open it is at least transparent to a predetermined degree to light, and when an aperture is closed, it substantially prevents the travel of light therethrough. Any type of controllable light valve can be used to construct each of the apertures. Movement detector 814 detects the movement of image detector 812. The detected movement can be a linear displacement, an angular displacement, and the derivatives thereof such as velocity, acceleration, and the like. [The operation system 800, according to data received from movement detector 814, is described herein below in connection with Figures 25A, 25B, 25C, 26A, 26B and 26C.]

In the claims:

1. (AMENDED) Stereoscopic device comprising:

at least two apertures, each said apertures including a light valve, each said light valves being operative to open at a different predetermined timing;

a multi wavelength light sensor array, and

a controllable multi wavelength illumination unit [,] illuminating a scene, said controllable multi wavelength illumination unit producing at least two alternating beams of light, each said beams of light characterized as being in a different range of wavelengths,

[wherein said multi wavelength light sensor array detects a plurality of images, each said images corresponding to a predetermined combination of an open state of a selected one of said light valves and a selected one of said at least two alternating beams of light]

a controller coupled with said multi wavelength light sensor array, said controller timing the operation of said multi wavelength light sensor array, to detect a plurality of images, for each said images only a single one of said light valves exhibits an open state and only one of said at least two alternating beams of light illuminates the detected scene.

20. (AMENDED) Method for detecting a stereoscopic image comprising the steps of:

alternating between at least two apertures, directed at an object;

producing a sequence of at least two illumination beams, at different ranges of wavelengths;

controlling the operation of said at least two apertures and the sequence of said at least two illumination beams, such that for each said image, only a single one of said apertures exhibits an open state and only one of said at least two illumination beams illuminates the detected scene; and

detecting a plurality of frames, each for a combination including a selected open one of said apertures and at least a selected illuminating one of said beams.